

Airborne Investigation of Soil Moisture and Vegetation Sensing Using Multipolarization Passive and Active Observations at L and S Bands

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ABSTRACT

This project involves flights of a new airborne sensor to investigate the benefits of multichannel active and passive microwave remote sensing of soil moisture. The sensor is the Passive/Active L/S-band Sensor (PALS) recently developed at JPL, designed to be flown on a C-130 aircraft. Plans are to fly the instrument over several field sites in conjunction with ground sampling of soil moisture and other soil and vegetation characteristics. The product of the task will be a set of calibrated instrument data, acquired over a variety of terrain types, from which the potential of the multichannel concept for spaceborne application can be evaluated.

The first experiment involving the PALS instrument was the 1999 Southern Great Plains Experiment (SGP'99) which took place in July 1999. The main site for surface truth collection was the Little Washita watershed, centered at the USDA/ARS facilities in Chickasha, OK. The primary objective of PALS was to fly at low altitude (for high spatial resolution) over a variety of targets with different vegetation covers and soil moistures, with some flight lines at higher altitude to investigate the effects of heterogeneity. Soil moisture samples were collected by ground teams as part of SGP'99 using gravimetric and dielectric techniques. In addition, soil temperature, vegetation characteristics, surface roughness, and surface flux data were acquired for several fields overflown by the PALS instrument. SGP'99 also included flights of four other airborne microwave sensors besides PALS which will provide an opportunity for cross-validation of the sensor responses, and an evaluation of the soil moisture signatures, across the frequency range from 1.4 to 7 GHz. Initial processing of the PALS data show excellent instrument sensitivity and calibration stability for the six days of flight data acquired. Data were acquired before and after a significant rain event, enabling multichannel microwave signatures of both soil wetting and drying conditions to be observed. Processing of the PALS data will be completed and made available by the end of calendar year 1999.